

Solutions: Hypothesis Testing Checkpoint

Question 1

A study was conducted in order to estimate μ , the mean number of weekly hours that U.S. adults use computers at home. Suppose a random sample of 81 U.S. adults gives a mean weekly computer usage time of 8.5 hours and that from prior studies, the population standard deviation is assumed to be $\sigma = 3.6$ hours.

A similar study conducted a year earlier estimated that μ , the mean number of weekly hours that U.S. adults use computers at home, was 8 hours. We would like to test (at the usual significance level of 5%) whether the **current** study provides significant evidence that this mean has changed since the previous year.

Using a 95% confidence interval of (7.7, 9.3), our conclusion is that:

- ☐ (a) the current study **does** provide significant evidence that the mean number of weekly hours has changed over the past year, since 8 falls outside the confidence interval.
- ☐ (b) the current study **does not** provide significant evidence that the mean number of weekly hours has changed over the past year, since 8 falls outside the confidence interval.
- ☐ (c) the current study **does** provide significant evidence that the mean number of weekly hours has changed over the past year, since 8 falls inside the confidence interval.
- ☐ (d) the current study **does not** provide significant evidence that the mean number of weekly hours has changed over the past year, since 8 falls inside the confidence interval.
- ☐ (e) None of the above. The only way to reach a conclusion is by finding the p-value of the test.

Select one answer.
10 points

Correct answer: (d)

Question 2

Which of the following facts about the p-value of a test is correct?

- ☐ (a) The p-value is calculated under the assumption that the null hypothesis is true.
- ☐ (b) The smaller the p-value, the more evidence the data provide against H_0 .
- ☐ (c) The p-value can have values between -1 and 1.
- ☐ (d) All of the above are correct.
- ☐ (e) Just (a) and (b) are correct.

Select one answer.
10 points

Correct answer: (e)

The next two questions refer to the following information:

In June 2005, a CBS News/NY Times poll asked a random sample of 1,111 U.S. adults the following question: "What do you think is the most important problem facing this country today?" Roughly 19% of those sampled answered "the war in Iraq" (while the rest answered economy/jobs, terrorism, healthcare, etc.). Exactly a year prior to this poll, in June of 2004, it was estimated that roughly 1 out of every 4 U.S. adults believed (at that time) that the war in Iraq was the most important problem facing the country.

We would like to test whether the 2005 poll provides significant evidence that the proportion of U.S. adults who believe that the war in Iraq is the most important problem facing the U.S. has decreased since the prior poll.

Question 3

Which of the following are the appropriate hypotheses in this case?

- ☐ (a) $H_0: p = .19$ vs. $H_a: p < .19$
- ☐ (b) $H_0: p = .19$ vs. $H_a: p > .19$
- ☐ (c) $H_0: p < .25$ vs. $H_a: p = .25$
- ☐ (d) $H_0: p = .25$ vs. $H_a: p < .25$
- ☐ (e) $H_0: p = .25$ vs. $H_a: p$ not equal to .25

Select one answer.
10 points

Correct answer: (d)

Question 4

The following output is available for this test:

Test and CI for One Proportion

Sample	X	N	Sample p	95% Upper Bound	Z-Value	P-Value
1	211	1111	0.189919	0.209275	-4.62	0.000

The output indicates that: (choose the best answer)

- ☐ (a) we have extremely strong evidence to reject H_0 .
- ☐ (b) we have extremely strong evidence to reject H_a .
- ☐ (c) we have moderately strong evidence to reject H_0 .
- ☐ (d) there is probability of 0 that H_0 is correct.
- ☐ (e) there is probability of 0 that H_a is correct.

Select one answer.
10 points

Correct answer: (a)

The next three questions refer to the following information:

An automatic coffee machine dispenses cups of coffee whose volume per cup varies normally with the mean $\mu = 10$ oz. A quality-control researcher randomly selects 8 cups of coffee from the machine and finds that in this sample the mean volume is 9.92 oz. and the standard deviation is 0.23 oz.

Question 5

Do these data provide enough evidence to conclude that the mean volume per cup is below the target level?

Which of the following two outputs represents the correct way to conduct this test?

- ☐ (a)

One-Sample T

Test of $\mu = 10$ vs < 10

N	Mean	StDev	SE Mean	95% Upper Bound	T	P
8	9.92000	0.23000	0.08132	10.07406	-0.98	0.179

- ☐ (b)

One-Sample Z

Test of $\mu = 10$ vs < 10
The assumed standard deviation = 0.23

N	Mean	SE Mean	95% Upper Bound	Z	P
8	9.92000	0.08132	10.05376	-0.98	0.163

Select one answer.
10 points

Correct answer: (a)

Question 6

Which of the following represents the correct conclusion we can make based on the output you selected in the previous problem (and at the usual significance level of .05)?

- ☐ (a) The data provide enough evidence to reject H_0 and to conclude that the mean volume per cup is lower than the target level of 10 oz.
- ☐ (b) The data provide enough evidence to accept H_0 and to conclude that the mean volume per cup is at the target level of 10 oz.
- ☐ (c) The data do not provide enough evidence to reject H_0 , so we accept it, and conclude that the mean volume per cup is at the target level of 10 oz.
- ☐ (d) The data do not provide enough evidence to reject H_0 , nor to conclude that the mean volume per cup is lower than the target level of 10 oz.

Select one answer.
10 points

Correct answer: (d)

Question 7

While it is important for you to know how to apply the methods that are covered in this course, it is also important to be able to recognize situations when none of the methods is appropriate. In this problem, we have made slight changes to the "coffee machine" story.

Your task is to recognize in which of the options below the changes are such that none of the methods covered in this course can be applied for testing $H_0: \mu = 10$ vs. $H_a: \mu < 10$.

- ☐ (a) An automatic coffee machine dispenses cups of coffee whose volume per cup varies according to a distribution with mean $\mu = 10$ oz. A quality-control researcher randomly selects 8 cups of coffee from the machine and finds that in this sample the mean volume is 9.92 oz. and the standard deviation is 0.23 oz.
- ☐ (b) An automatic coffee machine dispenses cups of coffee whose volume per cup varies according to a distribution with mean $\mu = 10$ oz. A quality-control researcher randomly selects 40 cups of coffee from the machine and finds that in this sample the mean volume is 9.92 oz. and the standard deviation is 0.23 oz.
- ☐ (c) An automatic coffee machine dispenses cups of coffee whose volume per cup varies normally with mean $\mu = 10$ oz. and standard deviation $\sigma = 0.23$ oz. A quality-control researcher randomly selects 8 cups of coffee from the machine and finds that in this sample the mean volume is 9.92 oz.
- ☐ (d) An automatic coffee machine dispenses cups of coffee whose volume per cup varies according to a distribution with mean $\mu = 10$ oz. and standard deviation $\sigma = 0.23$ oz. A quality-control researcher randomly selects 8 cups of coffee from the machine and finds that in this sample the mean volume is 9.92 oz.
- ☐ (e) Both (a) and (d) are cases where we cannot run the test using the methods covered in this course.

Select one answer.
10 points

Correct answer: (e)